

**REMARKS**

Claims 1, 3-5, 7-14 and 19-24 are all the claims pending in the application. Claims 2, 6, 15-18 and 25-35 have been canceled.

Claim 1 has been amended to recite, in part, “A process for producing a modified polymer, comprising a first and second modification process, the first modification process comprising modifying a polymer produced by anionic polymerization using an alkaline metal compound and/or an alkaline earth metal compound as a polymerization initiator and having an active site of an organometal in a molecule by reacting the site thereof with a hydrocarbyloxysilane compound, and the second modification process comprising adding a condensation accelerator to the reaction system in the middle of the above reaction, and/or after completion thereof or adding a condensation accelerator to the reaction system in the middle of the above reaction and after the completion thereof, the condensation accelerator accelerates condensation of the modified polymer resulting in a condensed polymer, the condensed polymer being recovered from the system...”. Support for the amendment can be found in the present specification at, for example, pages 13-14, 17-18 and 21-25.

Claim 12 has been amended to further specify that the modified polymer obtained by the process of claim 1 is condensed at a modified moiety of said polymer. Support for the amendment can be found in the present specification at, for example, pages 13-14, 17-18 and 22.

Thus, no new matter has been added herein. Entry of the amendment is respectfully requested.

**Response to Claim Rejections Under 35 U.S.C. § 103(a)**

***A. Haynes and Ishikawa***

Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP 067 468 to Haynes (the Examiner cites to the U.S. equivalent, U.S. Patent No. 4,379,891) (“Haynes”), in view of U.S. Patent No. 6,191,247 to Ishikawa (“Ishikawa”). *See* Office Action at page 2, paragraph 4.

At the outset, and without commenting on the merits of the rejection, Applicants have canceled claims 25-35, as indicated above. As such, the rejection of claims 25-28, 30-31 and 33-35 are moot. Withdrawal of the rejection with respect to these canceled claims are respectfully requested.

Applicants traverse for the following reasons. The combination of Haynes and Ishikawa fail to disclose, suggest, or otherwise render obvious the recited features of the present claims, as discussed below.

**1. Claims 1, 3-5 and 7-11**

Haynes in view of Ishikawa fail to disclose, suggest, or otherwise render obvious the recited elements of Claims 1, 3-5 and 7-11, for the following reasons.

Neither Haynes nor Ishikawa, or combination thereof, disclose, suggest or otherwise render obvious a condensation accelerator that accelerates the condensation of modified polymers in a polymerization system, as recited in the present claims. Haynes discloses a modified polymer reacted with a modifier such as a gamma-glycidoxypipropyl-trimethoxy silane (GPTS) coupling agent. *See* Haynes at col. 1, ll. 58-65. Ishikawa discloses that “a silanol condensation catalyst is blended into the rubber composition in which silica and a silane coupling agent and/or a polysiloxane containing alkoxy silyl groups are blended, the silanol

condensation catalyst accelerates the reaction of the silanol groups on the surface of the silica particles and the silane coupling agent and alkoxypolysiloxane and causes the silane coupling agent or alkoxypolysiloxane to quickly cover the surface of the silica particles.” See Ishikawa at col. 12, ll. 12-21 (emphasis added).

As recited in amended claim 1, in the present invention, two modification processes are conducted. The first modification process is the modification of a polymer by reacting an active site thereof with a hydrocarbyloxysilane compound (first modification process). The second modification process is a condensation of the modified polymer by adding a condensation accelerator (one of the silanol condensation catalysts) to the reaction system (second modification process). The condensation accelerator accelerates the condensation (second modification process) of modified polymers in a polymerization system.

However, the condensation catalyst described in Ishikawa accelerates the reaction of the silanol groups with the surface of silica particles in a mixing stage of a rubber composition. Accordingly, the claimed condensation of modified polymers in a polymerization system is not conducted by the method described in Haynes in view of Ishikawa.

In view of the above, it is respectfully submitted that claims 1, 3-5 and 7-11 are patentable over Haynes in view of Ishikawa. Thus, withdrawal of the claim rejection is respectfully requested.

2. Claim 12

Claim 12 as amended herein is directed to a modified polymer obtained by the production process as described in claim 1, where the modified polymer is condensed at a modified moiety of said polymer.

First, Haynes discloses uncondensed modified polymer, not a condensed polymer.

Further, Haynes in view of Ishikawa results in modified polymer-silica composite.

On the other hand, in the present invention, a modified polymer is condensed at the modified moiety of the polymer and the molecular weight increases. This increased molecular weight of the polymer prevent cold flow of the polymer. It also results in improved handling of the polymer as well as improved reactivity of the polymer with silica. Haynes in view of Ishikawa fails to disclose, suggest or otherwise render obvious, this modified polymer, as recited in present claim 12.

Thus, it is respectfully requested that the rejection of claim 12 based on Haynes and Ishikawa be withdrawn.

3. Claims 14, 19-20, 21, 25-28, 30-31 and 33-35

Claim 14 is directed to a rubber composition comprising the modified polymer as described in claim 12 or 13. Claim 20 is directed to the rubber composition as described in claim 19, comprising 10 to 100 parts by weight of silica as the inorganic filler. Claim 21 is directed to a tire using the rubber composition as described in claim 14.

The reaction taught by Haynes in view of Ishikawa is completely different from that of the present invention. In Ishikawa, the following reaction of P-F, (a silane coupling agent or alkoxypolysiloxane) and silica having silanol groups  $\{(HO-(SiO_2)_n\}$  takes place:

→ P-F-silane coupling agent- $\{O-(SiO_2)_n\}$

→ P-F-alkoxypolysiloxane- $\{O-(SiO_2)_n\}$

where the modified polymer is denoted by P-F; P denotes a polymer chain; and F denotes the functional moiety derived from a silane coupling agent.

On the contrary, in the present invention a condensation accelerator (one of the silanol condensation catalysts) accelerates the condensation of modified polymers. The reaction of condensed P-F' and silica having silanol groups  $\{(HO-(SiO_2)_n\}$  proceeds as follows:

→ condensed P-F'- $\{O-(SiO_2)_n\}$ .

The condensed polymer is directly reacted with silica.

where the modified polymer is denoted by P-F'; and F' denotes functional moiety derived from a silane coupling agent. This reaction is not taught in Haynes in view of Ishikawa. Additionally, this reaction results in excellent dispersibility of the silica into a rubber composition, without bad effects to the physical properties of the cured rubber composition. However, this reaction is not disclosed, suggested, or otherwise rendered obvious by the reaction taught by Haynes in view of Ishikawa.

Thus, in view of the above, it is respectfully requested that the rejection of claims 14, 19-20 and 21 be withdrawn. As stated above, claims 25-35 have been canceled and therefore, the rejection is moot with respect to these claims.

***B. Haynes, Ishikawa and Materne***

Claims 23 and 32 have been rejected under §103 as being unpatentable over Haynes, in view of Ishikawa, and further in view of U.S. Patent No. 6,403,693 to Materne ("Materne"). *See* Office Action at pages 2 and paragraph bridging pages 4-5, paragraph 4.

Applicants respectfully traverse for at least the following reasons.

As discussed above, Haynes discloses a modified polymer reacted with a modifier such as a gamma-glycidoxypropyl-trimethoxy silane (GPTS) coupling agent. Ishikawa discloses dibutyl tin dilaurate as a silanol condensation catalyst which accelerates the reaction of the silanol groups on the surface of the silica particles with the silane coupling agent or

alkoxypolysiloxane. *See* Ishikawa at col. 12, ll. 12-24, 29. However, Ishikawa does not disclose tin bis(2-ethylhexanoate) nor titanium alkoxide (including, titanium tetrakis(2-ethylhexyl oxide)).

Materne fails to satisfy the deficiencies of Haynes and Ishikawa. Materne discloses bis(2-ethylhexanoate) tin, as a metal salt condensation reaction promoter. However, Materne discloses, “For example, it is hypothesized that utilization of a bis-(trialkoxyorganosilane) polysulfide compound, preferably a bis-(trialkoxyorganosilane) disulfide compound, in combination with a silane condensation reaction promoter for enhancing a reaction of the bis(trialkoxyorganosilane) polysulfide compound with silanol groups on the silica-based filler and, also, alkoxy moieties of the trialkoxyorganosilane polysulfide compound, react to form a polysiloxane which in turn, may lead to formation of a polysiloxane network at the surface of the filler and/or within the elastomer.” *See* Materne at col. 6, ll. 4-14. Thus, Materne discloses that the elastomer-filler composite having a polysiloxane network, similar to that disclosed in Ishikawa.

On the other hand, the present invention recites condensing a first modified polymer and a second modified polymer, which is not disclosed, suggested or otherwise rendered obvious by the combination of Haynes, Ishikawa and Materne.

Thus, in view of the above, it is respectfully requested that the rejection of claim 23 be withdrawn. As indicated above, and without commenting as to the merits of the rejection with respect to claim 32, claim 32 has been canceled and therefore, the rejection is moot with respect to this claim.

***C. Ozawa, optionally in view of Ishikawa***

Claims 1, 3-5, 7-14, 19-21, 24-28, 30-31 and 33-35 have been rejected under 35 U.S.C. § 103 as allegedly being unpatentable over WO 01/34658 to Ozawa (“Ozawa”) (the Examiner cites

to the U.S. equivalent, U.S. Patent No. 6,992,147), optionally in view of Ishikawa. *See* Office Action at page 5, paragraph 5.

Applicants respectfully traverse for at least the following reasons.

Ozawa discloses a pseudo-living polymer by coordination polymerization with a lanthanide-based catalyst. *See* Ozawa at col. 5, ll. 38-41. The physical properties of the pseudo-living polymer are quite different from those of a polymer by anion polymerization using an alkaline metal compound and/or an alkaline earth metal compound as a polymerization initiator, as recited in the present claims.

In the Office Action, it is asserted that, “Applicants are advised that Ishikawa’s silanol condensation catalyst is blended in a dry mixing stage for the rubber composition. As such, it is indeed added to the reaction system **after completion** thereof.” Office Action at page 5, paragraph 5 (emphasis in original). However, in the present invention, a condensation accelerator is added in the middle of the first modification process or after the first modification process, and before the second modification process (condensation reaction) in the reaction system to accelerate the condensation reaction.

Further, there is no silica in the reaction system of the present invention. So polymer-filler condensation cannot be conducted in the reaction system of the present invention.

Thus, in view of the above, it is respectfully requested that the rejection of claims 1, 3-5, 7-14, 19-21 and 24 be withdrawn.

Without commenting on the merits of the rejection, Applicants have canceled claims 25-35, as indicated above. As such, the rejections of claims 25-28, 30-31 and 33-35 are moot. Withdrawal of the rejection with respect to these canceled claims are respectfully requested.

**D. Ozawa, Ishikawa and Materne**

Claims 23 and 32 have been rejected as being unpatentable over Ozawa, optionally in view of Ishikawa, and further in view of Materne. *See* Office Action at pages 5 and 6, paragraph 5.

Applicants respectfully traverse for at least the following reasons.

As discussed above, Ozawa discloses the use of a condensation catalyst in liquid polymerization system. On the other hand, Ishikawa and Materne disclose the use of a condensation catalyst in a mixing stage of silica and modified polymer. Thus, the combination of Ozawa, optionally in view of Ishikawa, and further in view of Materne is improper, as there is no technical relevance between Ozawa and Ishikawa or Materne.

Thus, in view of the above, it is respectfully requested that the rejection of claim 23 be withdrawn. As indicated above, and without commenting on the merits of the rejection with respect to claim 32, claim 32 has been canceled and therefore, the rejection is moot with respect to this claim.

**E. Takeichi '908 and Ishikawa**

The Examiner has maintained the rejection of Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,228,908 to Takeichi ("Takeichi '908") in view of Ishikawa. Claims 23 and 32 have also been rejected as being unpatentable over Takeichi '908, in view of Ishikawa, and further in view of Materne. *See* Office Action at pages 6-7, Section 6.

Applicants respectfully traverse the rejection for at least the reasons set forth below.

Takeichi '908 discloses a polymer modified with an hydrocarboxysilane compound selected from the group consisting of unsubstituted and substituted tetraalkoxysilane compounds,

alkylalkoxysilane compounds, arylalkoxysilane compounds, alkenylalkoxysilane compounds, and halogeno-alkoxysilane compounds and a rubber composition having the polymer.

However, in Takeichi '908, the modification of a living polymer (first modification reaction) is completed without a condensation catalyst of Ishikawa and a condensation reaction (second modification reaction) cannot be conducted. In any event, even if a condensation catalyst of Ishikawa is added in the mixing stage of a rubber composition of Takeichi '908, a polymer-filler condensation is conducted in the mixing stage and a condensed polymer cannot be obtained.

In the Office Action, it is asserted that "Applicants are advised that Ishikawa's silanol condensation catalyst is blended in a dry mixing stage for the rubber composition. As such, it is indeed added to the reaction system after completion thereof." However, in the presently claimed invention, a condensation accelerator is added in the middle of the first modification process or after the first modification process, and before the second modification process (condensation reaction) in the reaction system to accelerate the condensation reaction.

Further, there is no silica in the liquid reaction system of the present invention. So a polymer-filler condensation cannot be conducted in the liquid reaction system of the present invention.

Thus, in view of the above, it is respectfully requested that the rejection of claims 1, 3-5, 7-14, 19-22 and 24 be withdrawn. As indicated above, claims 25-35 have been canceled and therefore, the rejection is moot with respect to these claims.

***F. Takeichi '908, Ishikawa and Materne***

Claims 23 and 32 have been rejected under §103 as allegedly being unpatentable over Takeichi '908 in view of Ishikawa and further in view of Materne.

Applicants respectfully traverse for at least the following reasons.

As discussed above, Takeichi '908 does not disclose the use of a condensation catalyst in liquid polymerization system. Ishikawa and Materne disclose the use of a condensation catalyst in a mixing stage of silica and modified polymer. Thus, the combination of Takeichi '908, in view of Ishikawa, and further in view of Materne is improper, as there is no technical relevance between Takeichi '908 and Ishikawa or Materne.

Thus, in view of the above, it is respectfully requested that the rejection of claim 23 be withdrawn. As indicated above, and without commenting on the merits of the rejection with respect to claim 32, claim 32 has been canceled. As such, the rejection with respect to claim 32 is moot and withdrawal is respectfully requested.

***G. Hogan and Ishikawa; and Hogan, Ishikawa and Materne***

Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,573,412 to Hogan ("Hogan") in view of Ishikawa. See Office Action at page 8, paragraph 7. Claims 23 and 32 have also been rejected as being unpatentable over Hogan, in view of Ishikawa, and further in view of Materne. *See id.*

Applicants respectfully traverse for at least the following reasons.

As acknowledged by the Examiner, Hogan fails to disclose a condensation accelerator. Accordingly, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Hogan. Applicants rely upon the above discussion regarding Ishikawa and Materne, and submit that Ishikawa and Materne both fail to satisfy the deficiencies of Hogan.

Thus, in view of the above, it is respectfully requested that the rejection of claims 1, 3-5, 7-14, 19-22, 23 and 24 be withdrawn. As indicated above, claims 25-35 have been canceled and

therefore, the rejection is moot with respect to these claims. Withdrawal of the rejection with respect to claims 25-35 is also respectfully requested.

***H. Morita and Ishikawa; Morita, Ishikawa and Materne***

Claims 1, 3-5, 7-14, 19-22, 24-31 and 33-35 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,369,167 (“Morita”), in view of Ishikawa. Claims 23 and 32 have also been rejected as being unpatentable over Morita, in view of Ishikawa, and further in view of Materne. *See* Office Action at page 9, paragraph 8.

Applicants respectfully traverse for at least the following reasons.

As acknowledged by the Examiner, Morita fails to disclose a condensation accelerator. Accordingly, a second modification reaction (polymer condensation reaction) cannot be conducted in the polymers disclosed by Morita. Applicants rely upon the above discussion regarding Ishikawa and Materne, and submit that Ishikawa and Materne both fail to satisfy the deficiencies of Morita.

Thus, in view of the above, it is respectfully requested that the rejection of claims 1, 3-5, 7-14, 19-22, 23 and 24 be withdrawn. As indicated above, claims 25-35 have been canceled and therefore, the rejection is moot with respect to these claims. Accordingly, withdrawal of the rejection of claims 25-35 is respectfully requested.

***I. Takeichi '295 and Ishikawa; Takeichi '295, Ishikawa and Materne***

Claims 1, 3-5, 7-14, 19-21 and 22 have been rejected under § 103 as being unpatentable over U.S. Patent No. 6,008,295 to Takeichi (“Takeichi ‘295”) in view of Ishikawa. Claims 23 and 32 have been rejected as allegedly being unpatentable over Takeichi ‘295, in view of Ishikawa, and further in view of Materne. *See* Office Action at page 10, paragraph 9.

Applicants respectfully traverse for at least the following reasons.

As discussed above, the Patent Office acknowledges that Takeichi '295 fails to disclose a condensation accelerator. Accordingly, a second modification process (polymer condensation process) cannot be conducted in the polymers disclosed in Takeichi '295. Applicants further rely upon the above discussion regarding Ishikawa and Materne, and submit that Ishikawa and Materne fail to satisfy the deficiencies of Takeichi '295.

Thus, in view of the above, it is respectfully requested that the rejection of claims 1, 3-5, 7-14, 19-21, 22 and 23 be withdrawn. As indicated above, claim 32 has been canceled and therefore, the rejection is moot with respect to this claim. Withdrawal of the rejection of claim 32 is also respectfully requested.

**CONCLUSION**

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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Date: November 25, 2008